User´s Manual

VENTILATION/ANESTHESIA

COMPRESSOR MINI

MAQUET

CRITICAL CARE

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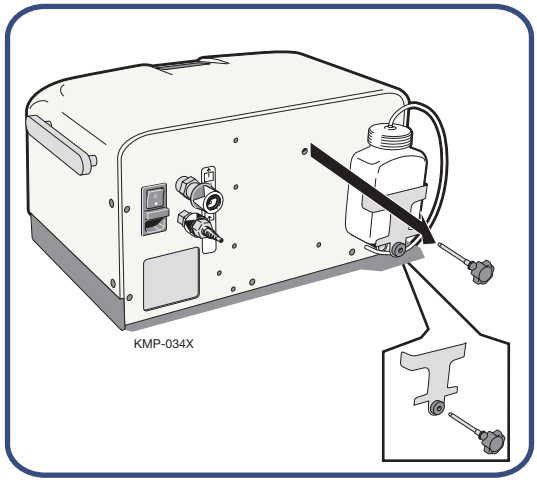
General information

This symbol on the unit means: Attention, consult accompanying documents.

CE 0413 The device complies with the requirements of the Medical Device Directive 93/42/EEC.

- The Compressor Mini may only be used by authorized personnel. Users must have a thorough knowledge of the unit and follow the instructions in this Operating Manual.
- The owner or user is solely responsible for safety if the equipment is not used as intended, or has been serviced or repaired by personnel not authorized by MAQUET.
- Documentation for the Compressor Mini consists of:
  - Operating Manual
  - Service manual
  - Spare parts list
  - Installation instructions



- Remove the transport safety lock before the compressor is used. Place it in the transport safety lock holder.
- After unpacking the compressor, carry out a function check.
- Pressure data for the Compressor Mini is given in psi or kPa.

  1 psi = 6,895 kPa

  1 kPa = approx. 10 cm H_2O

  100 kPa = 1 bar ~ 1 atm ~ 1 kgf/cm^2 (kp/cm^2)
- In addition to the Important information here, always follow local and national regulations.
- The central compressed air supply, when connected to Compressor Mini, must not exceed a pressure of 94 psi (650 kPa/6.5 bar).

1. Before use

Connection

- The function check must always be carried out before the unit is put into use, or once a week when the unit is in continuous use.
- Make sure the mains power and gas fulfill requirements for medical equipment.
- The Compressor Mini must only be connected to a grounded outlet.

Operation

- When in use, the compressor must be placed so that the air vents at the back and on the underside are not covered.
- When in use, the drainage bottle must be checked regularly.
- If the temperature alarm or the pressure alarm is activated during operation, make sure that a fully operational compressor is connected as soon as possible.

Cleaning

The unit should be cleaned at least every 200 hours of operation or once a week when in continuous use. If the compressor is used in a dusty environment the dust filters must be cleaned daily.

Service

- Service and repair must be carried out at regular intervals by MAQUET-authorized service personnel as follows:
  - 5 000 hour preventive maintenance
  - 10 000 hour preventive maintenance
- Only original parts from MAQUET must be used in the compressor.

Intended use

The intended use of the Compressor Mini is to supply dry, filtered, compressed air for a medical respiratory ventilator or anesthesia machine that is compatible with the specifications of the Compressor Mini. Its capacity is approx. 30 l/min at 50 – 64 psi (350 – 450 kPa/3.5 – 4.5 bar).

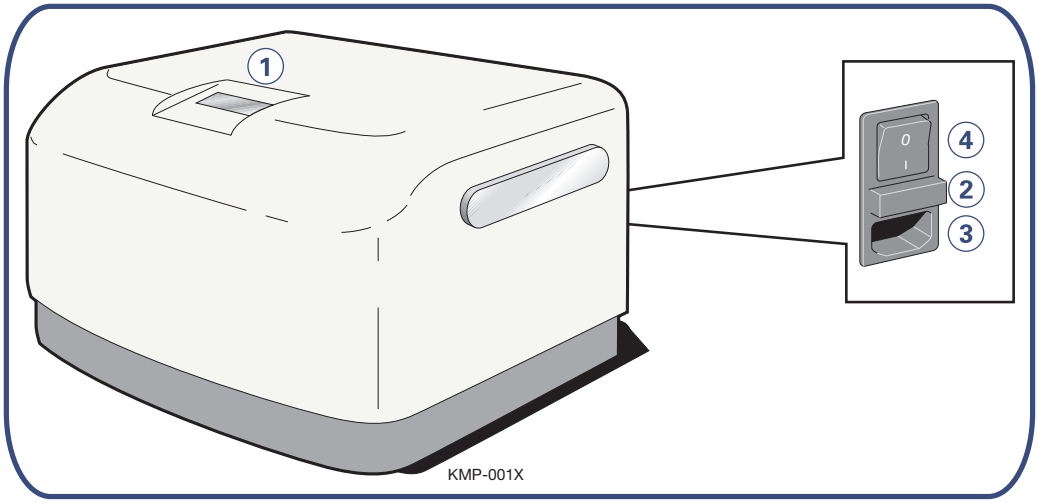
Intended user

The Compressor Mini may be used only by health care providers who have sufficient training and experience.

Caution

- The Compressor Mini has been designed and tested to comply with requirements specified in electromagnetic compatibility standard EN 60601-1-2. It is the responsibility of the user to take necessary measures to ensure that the EMC environment in which the system will be used is compatible with the requirements of EN 60601-1-2. If limits are exceeded, this may impair the safety of the system. Such measures should include, but are not limited to:
  - normal precautions with regard to relative humidity and conductive characteristics of clothing in order to minimize the build-up of electrostatic charges
  - restricted use of cellular phones.
- This compressor can provide only limited flow of compressed air (30 l/min), and the compressed air will not be dried to the same standard as compressed medical air. The water content and the limited air flow may adversely affect the operation of, or may damage, certain ventilators or other equipment. Verify that the equipment to be supplied by this compressor is compatible.
- Do not direct the flow of compressed air towards the eyes or other unprotected parts of the body.
- Federal law restricts this device to sale by or on the order of a physician.

1. Before use



Description

The Compressor Mini can be placed on a ventilator cart to form a compact unit that is easy to move. Since the compressor runs very quietly, it can be used at bedside with a minimum of disturbance.

The Compressor Mini is fitted with three alarms:

- a temperature alarm that is activated if the compressor overheats,
- a pressure alarm that is activated if the air pressure drops or increases, outside the specified ranges,
- a power failure alarm.

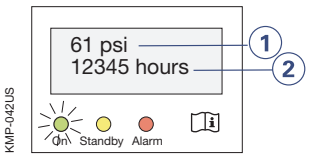
A high pitched audible alarm is heard, together with an LED indication and a text displayed. The Compressor Mini is equipped with a Standby function. In Standby mode, the compressor will start to deliver compressed air to the ventilator if the central compressed air supply fails. The compressor stops automatically when the central air supply returns.

The system

1. Display
2. Fuse holder
3. Mains inlet
4. Mains switch
   - Turns the Compressor Mini on (I) and off (O).

2. Device description

Display messages



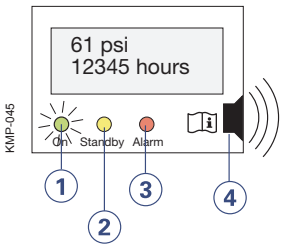
KMP-042US

The display shows status of the compressor, current outlet air pressure, different alarm messages and elapsed operating hours.

1. Outlet air pressure
   - The air pressure delivered by the compressor is normally between 50 – 64 psi (350 – 450 kPa/3.5 – 4.5 bar).
2. Operating time
   - Elapsed operating hours.

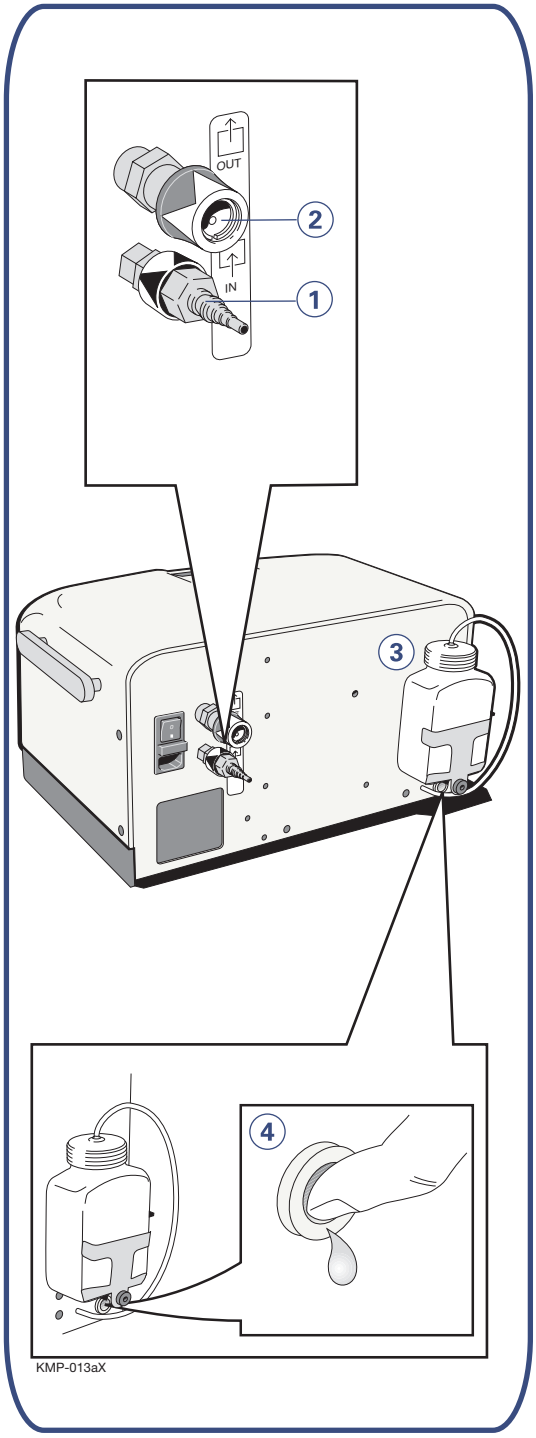
Display LED's

There are three lamps (LEDs), green, yellow and red, indicating the status shown on the display above the lamps.



1. Green LED - On
   - The green LED lights up when the mains switch is on. Display message: The pressure in the compressor and elapsed operating hours (when green LED only).
2. Yellow LED - Standby
   - The yellow Standby LED will be on while the central compressed air supply is sufficient from the central air supply to the ventilator via the compressor. Display message: The central compressed air pressure and the word STANDBY.
3. Red LED - Alarms
   - The red Alarm LED indicates different alarm situations. Display message: Shows if the alarm is related to gas distribution, dryer condition or overheating of the compressor. The alarms are described in detail in the Alarms section.
4. Audible alarm
   - A buzzer for audible alarm signals (3 beeps/second). The buzzer sounds when an alarm is activated.

2. Device description



Connections

1. Inlet
2. Outlet
3. Drainage bottle
4. Condensation drain valve
   - Empty the air reservoir by pressing the pin on the drain valve while the compressor is running.

Compressed air

When the Standby function is required, air from the central compressed air supply is connected to the inlet.

The compressed air hose to the ventilator is connected to the compressed air outlet

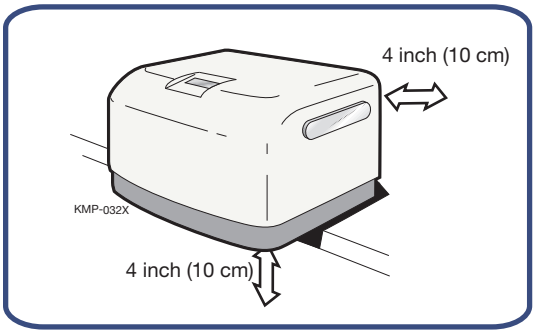
Drainage bottle

There is a water separator in the compressor. It is automatically emptied twice a minute by a solenoid valve. The water collected in the water separator drains into the drainage bottle. A brief ”pssh” sound is heard each time the solenoid valve opens. The bottle must be checked regularly and emptied when necessary. The higher the degree of humidity in the ambient air, the quicker the bottle fills

Condensation drain valve

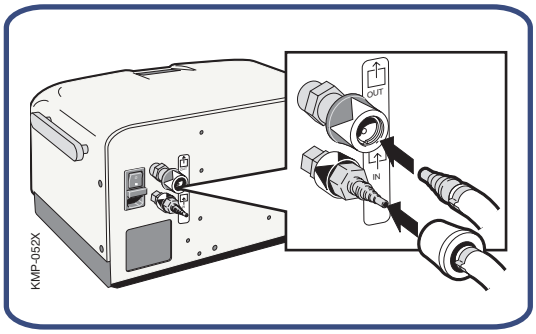
The drain valve is used to ensure that there is no water build-up in the air reservoir by releasing any collected condensed moisture. If the compressor is running continuously, a small amount of water may collect in the air reservoir.

Preparation



- Place the compressor in a suitable location. The air vent at the back of the compressor must not be covered or blocked
  - Do not place the compressor near a radiator or heating unit, since the operating temperature might increase and activate the temperature alarm.
  - When the compressor is used as a standby unit, connect the central compressed air supply to the air inlet on the compressor.
  - Check that an empty drainage bottle is fitted.
  - MAQUET Compressor Mini mounting kits are mandatory for both stand-alone arrangements and for mounting on carts. The mounting kits ensure that there is sufficient air circulation around the compressor.

Connection



- Connect the compressed air hose from the compressor air outlet to the ventilator.
  - Plug in the compressor mains cable to a grounded outlet.

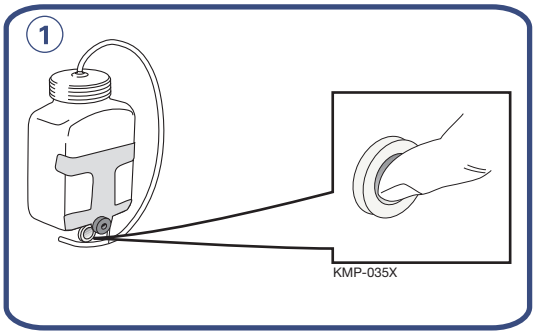
Start-up

A function check should be done before the unit is put into use, and once a week when in continuous use.

Caution: If a fault is discovered during the function check, the compressor must not be used until it has been repaired by authorized service personnel.

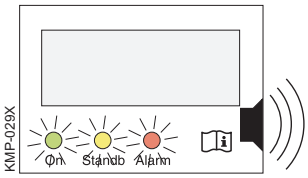
3. Preparation/Connection

Function check



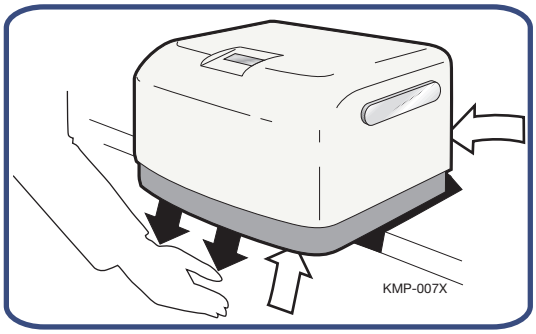
1. To check the internal air reservoir for water, press the pin on the drain valve.

- Disconnect the inlet (if connected) and outlet air connection to the compressor.
- Start the compressor with the Mains switch.



- Make sure that the startup sequence runs:
  - The display and LEDs light up and the alarm buzzer sounds
  - The display shows Comp Mini, the software version, the air pressure and the elapsed operating hours.
- Check that the air pressure is between approximately 50 – 64 psi (350 – 450 kPa/3.5 – 4.5 bar).

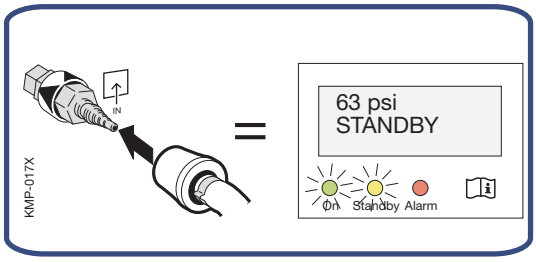
Cooling fans



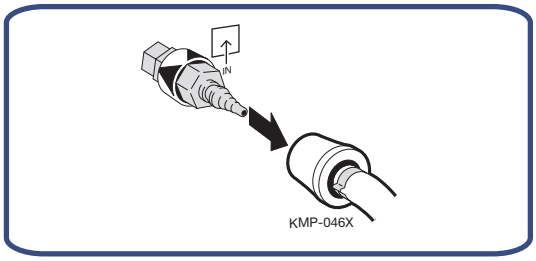
- Make sure that air circulates through the ventilating holes.

4. Function check

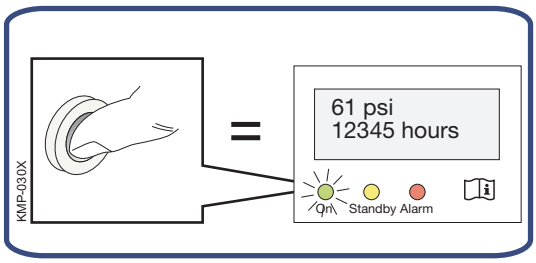
Standby mode (when applicable)



- Connect the central air supply.
  - The compressor is automatically switched off when the air pressure exceeds 44 psi (300 kPa/3.0 bar) for more than 30 seconds.

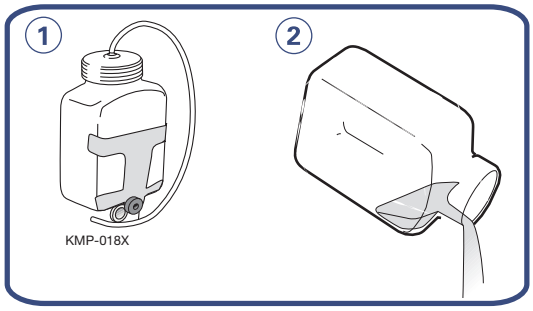


- Disconnect the central air supply

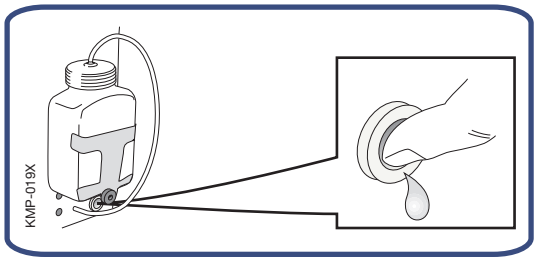


- Decrease the internal pressure with the manual drain valve. When the air pressure drops below approximately 36 psi (250 kPa/2.5 bar) for more than 2 seconds the compressor starts.

Checks during operation



1. Check the water level in the drainage bottle regularly.
2. Empty the bottle if necessary; the compressor does not need to be turned off.

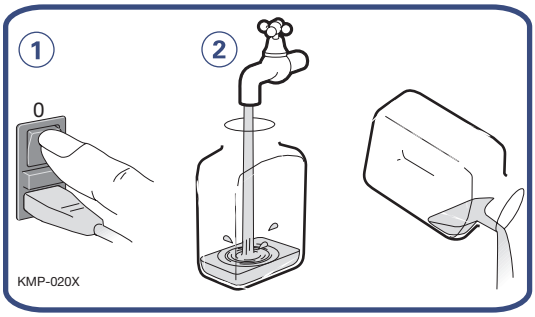


- To check the internal air reservoir for water, press the pin on the drain valve. Check that no water, or only a very small amount of water flushes out through the drain valve.

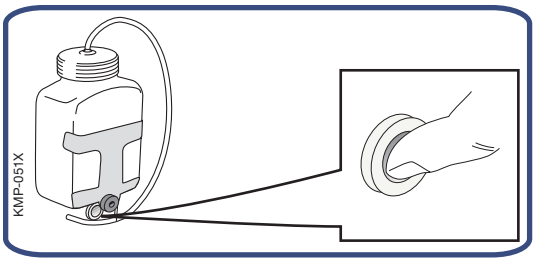
Preventive maintenance

5 000 hour maintenance	10 000 hour maintenance
The filters must be replaced after every 5000 hours of operation by authorized service personnel.	Authorized service personnel carry out the maintenance after 10 000 hours of operation.

Shut-off for storage



1. Switch off the compressor.
2. If the compressor is not to be used for a long period, empty, wash and drain the drainage bottle



- Drain the air reservoir by pressing the manual drain valve.

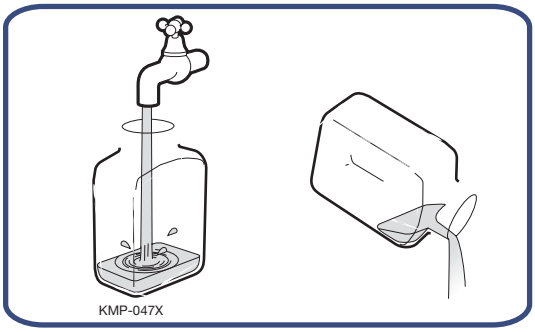
5. Preventive maintenance / Storage

Daily cleaning

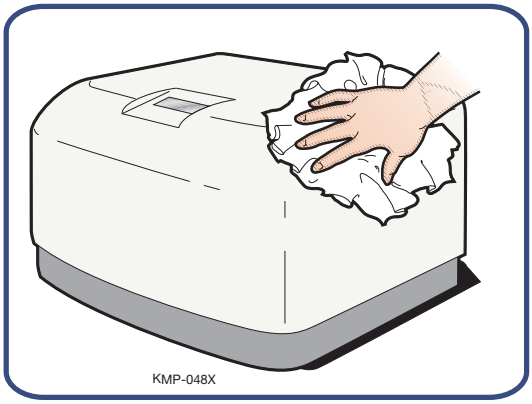
If the compressor is used in a dusty environment, the dust filters must be cleaned daily.

200 hour cleaning

The compressor should be cleaned after every 200 hours of operation or once a week when in continuous use.

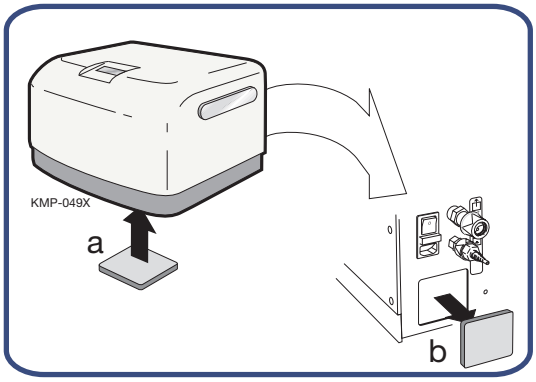


- Wash the drainage bottle

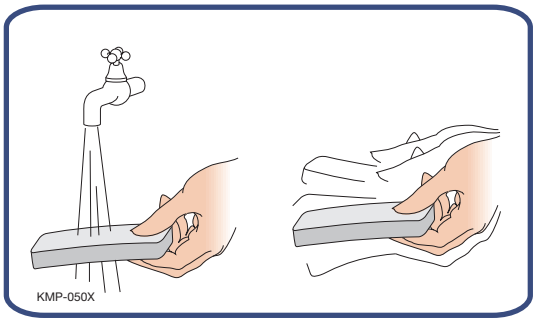


- Wipe all parts with a soft lint-free cloth moistened in soap and water or detergent-based disinfectant.

Note: In case of more contaminated surfaces use ethylene alcohol or isopropyl alcohol.



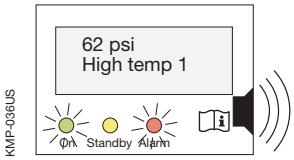
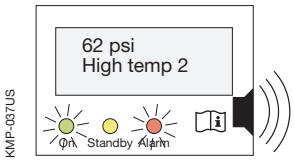
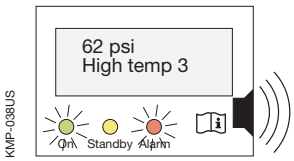
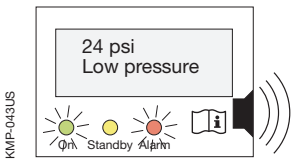
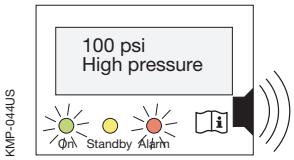
- Clean the dust filters (a+b) on the back and the underside of the compressor if necessary



- The dust filters may be rinsed in water. Ensure the filters are free of excess water before returning them to the compressor.

6. Cleaning

Alarms

Alarms	Description
High temp alarm 1 	The red LED and the alarm buzzer are activated if the temperature inside the compressor unit exceeds 158 °F ±5 °F (70 °C ±3 °C) [temp. difference]. The alarm is activated until the temperature drops below 131 °F ±11 °F (55 °C ±6 °C) [temp. difference], or the compressor is switched off.
High temp alarm 2 	The red LED and the alarm buzzer are activated if the temperature difference between ambient air and the temperature in the dryer is less than approx. 4 °F (2 °C) after 15 minutes operating time. The alarm is activated until the temperature difference between ambient air and the temperature in the dryer exceeds approx. 7 °F (4 °C).
High temp alarm 3 	The red LED and the alarm buzzer are activated if the temperature in the dryer exceeds 131 °F ±11 °F (55 °C ±6 °C) [temp. difference]. The alarm is activated until the temperature inside the dryer drops below 122 °F ±11 °F (50°C ±6 °C) [temp. difference].
Low pressure alarm 	The red LED and alarm buzzer are activated if the compressed air pressure drops and stays below 29 psi (200 kPa/2 bar) for more than 5 seconds. The alarm is activated until the air pressure rises above approx. 36 psi (250 kPa/2.5 bar) for more than 5 seconds, or the compressor is switched off.
High Pressure alarm 	The red LED and alarm buzzer are activated if the compressed air pressure rises and stays above 94 psi (650 kPa/6.5 bar) for more than 0.5 second. The alarm is active until the air pressure drops and stays below 87 psi (600 kPa/6 bar) for more than 5 seconds, or the compressor is switched off.
Power failure alarm	Power failure. The alarm buzzer is activated for about 12 seconds.

7. Alarms

Troubleshooting

Malfunction	Reason and action
The compressor does not start; the main LED is not lit.	• Check that the mains cable is correctly plugged into the mains in/outlet. • If it still does not start, fuses may be blown. Only authorized personnel may check and replace fuses.
Pressure alarm is activated.	• Too high air consumption. The compressor cannot supply the connected equipment. Check the tubing for leakage. • If the alarm continues contact authorized service personnel.
Temperature alarms activated.	• Ambient air temperature is too high. Run at a cooler temperature. • The air vents at the back or on the underside of the compressor are covered or blocked. Remove obstacles. • The dust filters are clogged. Clean or replace. • Cooling fan or dryer malfunction. Contact authorized service personnel.
Abnormally large quantities of water flush out from the drain valve when the valve pin is depressed.	The cooler/dryer system is not performing correctly. Contact authorized service personnel.

8. Troubleshooting

9. Technical data

General	
Dimension	W 17", D 13", H 10" inches (W430, D 330, H250 mm)
Weight	approx. 57 lbs (26 kg)
Classification	Class I equipment according to IEC 60601-1/EN 60601-1
Power consumption	550 W at nominal voltage
Noise level at 1m distance	approx. 50 dB(A)
Power supply	115 V ~, 60 Hz (single phase). 220–240 V ~, 50 Hz (single phase).
Compressor capacity	
Continuous flow at normal atmospheric pressure (approx. 1013 hPa)	30 l/min (expanded to ambient air pressure) at 50 psi (350 kPa/3.5 bar)
Operating pressure (at normal setting of the internal pressure regulator)	50–64 psi (350–450 kPa/3.5 – 4.5 bar)
Dew point suppression at 30 l/min	>9 °F (5 °C) [temp. difference] at 50 psi (350 kPa/3.5 bar)
Built-in air reservoir	1.25 litres
Environmental conditions – Operation	
Ambient temperature:	
– Total working range	
– Full capacity range (30 l/min)	+59 °F to +86 °F (15 °C to 30 °C)
– Reduced capacity range*	+50 °F to +59 °F and +86 °F to +104 °F (10 °C to 15 °C and 30 °C to 40 °C)
Ambient relative humidity:	
– Total working range	
– Full capacity range (30 l/min)	15% to 90%
– Reduced capacity range*	>90%
Ambient atmospheric pressure:	
– Total working range	
– Full capacity range (30 l/min)	950 to 1060 hPa (712 to 795 mmHg)
– Reduced capacity range*	660 to 950 and 1060 to 1200 hPa

9. Technical data

***Reduced capacity:**

Expected flow and dew point suppression	24 l/min, 5 °F (3 °C) [temp. difference] at 50 psi (350 kPa/3.5 bar). This reduced capacity applies if one or more of the limitations above apply.

Note: At a continuous flow of >30 l/min (normal for an adult patient is 8–10 l/min) a surrounding temperature of approximately 104 °F (40 °C), and a relative humidity of >90% RH, the pressure dew point could be less than 5 °F (3 °C).

Environmental conditions – Transport and storage

Ambient temperature	-40 °F to +158° F (-40 °C to +70 °C)
Ambient relative humidity	10% to 95%
Ambient atmospheric pressure	500 to 1 200 hPa (375 to 900 mmHg)

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